

# PATENT SPECIFICATION

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## DRAWINGS ATTACHED

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## (54) BALL JOINT FOR FLUID LINES

(71) We, AEROQUIP A.G., a Swiss Body Corporate, of Bahnhofstrasse 17, Zug, Switzerland, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to a ball joint for low pressure fluid lines, and more particularly to ball joints made of sheet metal for use in such lines to permit angular and torsional adjustment thereof. The invention is particularly adapted for installations subjected to high temperatures where it is desired to minimize leakage of the fluid.

Prior art low pressure ball joints normally consist of two tubes having interfitting ball and socket portions. It is difficult to prevent leakage between the ball and socket surfaces in such joints without making the metal-to-metal contact so tight as to interfere with free bending of the joint without metal galling and seizure. Furthermore such joints have a tendency to loosen after being subjected to cyclic temperature relations or to vibration.

Another prior art type of joint uses a polished spherical ball, a machined casing, two gaskets and a retaining flange or nut. Such parts however are expensive and are only used in highly sophisticated equipment such as certain steam line installations.

According to the present invention, there is provided a ball joint comprising a sheet metal ball member having a tubular portion and a partially spherical portion bulging outwardly from the tubular portion and then curving inwardly, a sheet metal socket member having a tubular portion and a partly spherical portion for receiving the inwardly curving ball member portion when the tubular portions of the two members are aligned, a sheet metal retainer of partially spherical shape resting against the outwardly bulging ball member portion when

the tubular portions of the members are aligned, outwardly extending facing flanges on said retainer and the partly spherical portion of said socket member, a gasket disposed between said flanges, a sheet metal clamping ring surrounding said flanges, and adjustable means for drawing said clamping ring tight, the relative shapes of the clamping ring and flanges being such that tightening of the clamping ring will cause said gasket to be pressed against said partially spherical portion of said ball member to create a fluid-tight seal.

The gasket may be split, most preferably by a scarf cut on a double bias thereby providing abutting ends so that adjustment of the gasket to prevent leakage may take place both radially and circumferentially. Other types of gaskets such as O-rings and nylon rings could also be used.

Due to the ball and socket construction the ball joint of the present invention may readily be bent to the desired shape for installation. It is of light weight and may be manufactured at low cost, offering a compact shape while still maintaining minimum leakage even at high temperatures. There is very little metal-to-metal contact in the joint, thus minimizing frictional wear and enhancing the life of the unit which requires only seal replacement at periodic intervals. The clamping device permits tightening of the seal as it wears. Furthermore, since the parts may be easily disassembled and the ball and socket separated, the use of the joint may simplify installation and servicing of fluid lines.

In order that the present invention may more readily be understood, the following description is given, merely by way of example, reference being made to the accompanying drawings, in which:—

Figure 1 is a perspective view of a ball joint according to the present invention;

Figure 2 is a partially sectioned view in elevation thereof;

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Figure 3 is a side elevational view of the gasket employed in the joint of Figures 1 and 2;

Figure 4 is an end elevational view thereof; and

Figure 5 is a partial perspective view thereof.

The joint is generally indicated at 11 and comprises a ball member generally indicated at 12 and a socket member generally indicated at 13. Ball member 12 has a tubular portion 14 and a partially spherical portion 15, the spherical portion bulging outwardly from the tubular portion and then curving part way back to a smaller diameter.

Socket member 13 comprises a tubular portion 16 and a partially spherical portion 17 the inner surface of which has substantially the same radius of curvature as the outer surface of portion 15. Portion 17 however, does not extend fully to the maximum diameter, but instead has an outwardly extending flange 18 which is inclined away from portion 17.

A retainer 19 is provided, this retainer being a relatively short annular piece with its inner surface having the same radius of curvature as the outer surface of ball portion 15. Retainer 19 rests on ball portion 15 and has a flange 21 which extends outwardly and inclined away from member 19. The outer edge 22 of member 19 is bent slightly away from the surface of ball 15 to prevent undue friction and to act as a stop when the joint is bent.

A split gasket 23 is disposed between the flanges 18 and 21. This gasket may be formed of any suitable material such as asbestos carbon graphite, and is wider at the base than at the top, as seen in Figures 2 and 4. Abutting ends 24 of the split gasket 23 have a scarf cut on double bias, as seen in Figure 3, 4 and 5.

A clamping ring generally indicated at 25 surrounds flange 18 and 21, this ring having a central web 26, a pair of side walls 27 and 28, and outwardly extending flanges 29 and 31 extending from walls 27 and 28 respectively. The ring is split and has two upstanding bolt receiving posts 33 and 34 which have apertures receiving a bolt 35 therethrough. This bolt has a nut 36 which, when tightened will draw together posts 33 and 34. The central portion 32 of ring 25 is flattened, as seen in Figure 1, to provide a spring-like portion which tends to urge the posts 33 and 34 apart. The tightening of the nut causes a wedging action of walls 27 and 28 against inclined flanges 18 and 21, pulling the flanges more tightly against gasket 23, and creating a radially inward force on the gasket tending to tighten it against ball portion 15. Clamping ring 25 will thus unite members 13, 19, 23 and 25 into a unitary assemblage capable of being deflected with

respect to ball member 12 by the exertion of lateral forces on members 12 and 13. Although a clamping ring of the type shown is desirable, other types of clamps such as a bolted ring or a threaded ring and nut could also be used.

In operation, fluid flow through members 12 and 13 will not leak through the ball joint since it will be stopped by gasket 23 pressing against flanges 18 and 21 as well as ball portion 15. This will not interfere with bending of the ball joint since there need be very little metal-to-metal contact. After some use, should gasket 23 be worn, it may be drawn more closely against ball portion 15 by tightening nut 36. The limit of deflection of the ball joint will be engagement of tubular portion 14 of member 12 with edge 22 of retainer 19.

The double biased scarf joint of gasket 23 will permit its continued adjustment without permitting leakage past the abutting gasket ends. Should gasket 23 become worn, it is merely necessary to loosen nut 36, permitting posts 33 and 34 to spread apart, and slide ring 25 out of the way to permit the withdrawal of retainer 19 so that gasket 23 may be removed and replaced. Similarly, the parts may be disassembled in order to use the joint as a connector for two parts of the fluid line.

#### WHAT WE CLAIM IS:—

1. A ball joint comprising a sheet metal ball member having a tubular portion and a partially spherical portion bulging outwardly from the tubular portion and then curving inwardly, a sheet metal socket member having a tubular portion and a partly spherical portion for receiving the inwardly curving ball member portion when the tubular portions of the two members are aligned, a sheet metal retainer of partially spherical shape resting against the outwardly bulging ball member portion when the tubular portions of the members are aligned, outwardly extending facing flanges on said retainer and the partly spherical portion of said socket member, a gasket disposed between said flanges, a sheet metal clamping ring surrounding said flanges, and adjustable means for drawing said clamping ring tight, the relative shapes of the clamping ring and flanges being such that tightening of the clamping ring will cause said gasket to be pressed against said partially spherical portion of said ball member to create a fluid-tight seal.

2. A ball joint according to claim 1, wherein said flanges are inclined toward each other, said clamping ring having a central web and a pair of inclined walls complementary to and engaging said flanges.

3. A ball joint according to claim 2, wherein said adjustable tightening means on

the clamping ring comprises a pair of posts on the clamping ring, a bolt passing through said posts, and a nut on said bolt.

- 5 4. A ball joint according to claim 3, wherein said clamping ring includes a flattened spring-like portion disposed opposite said posts to urge said posts apart.

- 10 5. A ball joint according to claims 1, 2, 3 or 4, wherein said gasket is wider at its base than at its outer portion, and is split by a

scarf cut on a double bias to provide two abutting ends to the gasket.

6. A ball joint substantially as hereinbefore described with reference to and as shown by the accompanying drawings. 15

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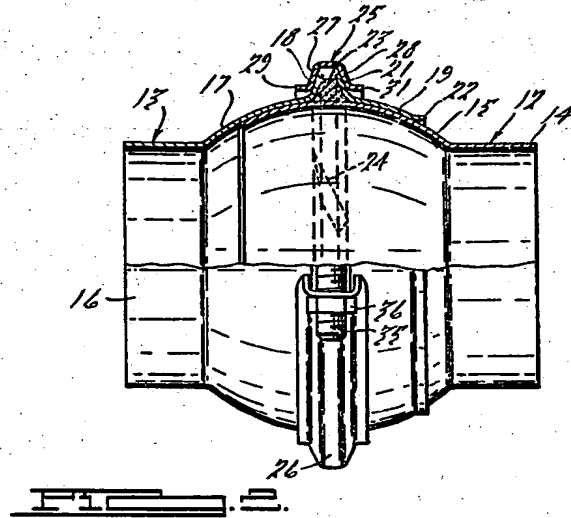
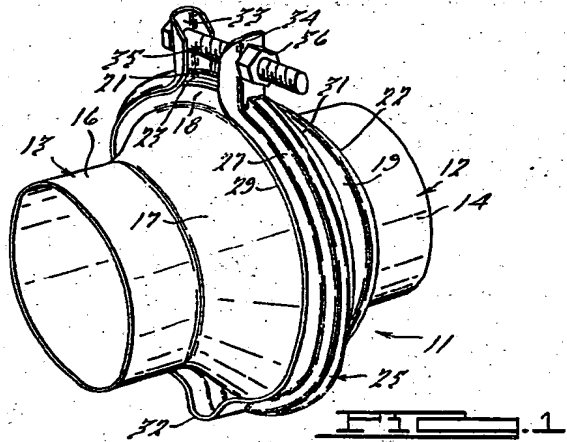
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COMPLETE SPECIFICATION

2 SHEETS

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Sheet 1



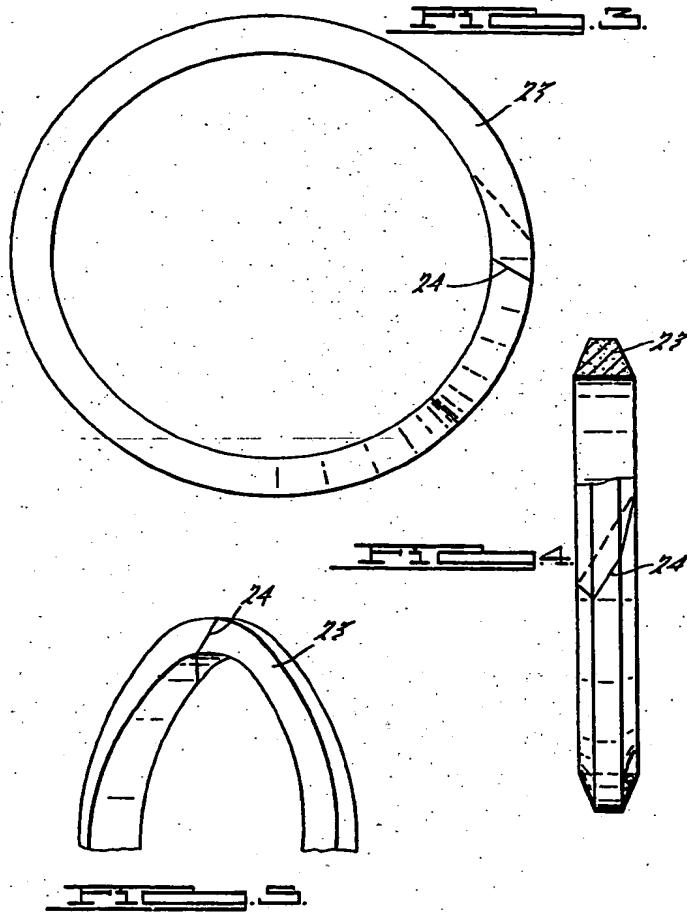
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COMPLETE SPECIFICATION

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Sheet 2



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